



PATENT APPLICATION

PATENT AND TRADEMARK OFFICE

BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the Application of

On Appeal from Group: 1743

Gerhardus HAAK et al.

Application No.: 09/914,794

Examiner: S. SIEFKE

Filed: September 5, 2001

Docket No.: 110510

For: SOLID PHASE EXTRACTION INSTRUMENT AND METHOD FOR SOLID PHASE EXTRACTION

APPEAL BRIEF TRANSMITTAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Attached hereto is our Brief on Appeal in the above-identified application.

Also attached hereto is our Check No. 171806 in the amount of Five Hundred Dollars (\$500.00) in payment of the Brief fee under 37 C.F.R. 1.17(c). In the event of any underpayment or overpayment, please debit or credit our Deposit Account No. 15-0461 as needed in order to effect proper filing of this Brief.

For the convenience of the Finance Division, two additional copies of this transmittal letter are attached.

Respectfully submitted,

Leana Levin

James A. Oliff
Registration No. 27,075

Leana Levin
Registration No. 51,939

JAO:LL/tlp

Date: October 17, 2005

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

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EXTRACTION

BRIEF ON APPEAL

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Appeal from Group 1743

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400
Attorneys for Appellants



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I. REAL PARTY IN INTEREST

The real party in interest for this appeal and the present application is Spark Holland B.V., by way of an Assignment recorded in the U.S. Patent and Trademark Office at Reel 012260, Frame 0545.

II. STATEMENT OF RELATED APPEALS AND INTERFERENCES

There are no prior or pending appeals, interferences or judicial proceedings, known to Appellant, Appellant's representative, or the Assignee, that may be related to, or which will directly affect or be directly affected by or have a bearing upon the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1 and 3-7 are on appeal.

Claims 1 and 3-30 are pending.

Claims 1 and 3-7 are rejected.

Claims 8-30 are withdrawn from consideration.

IV. STATUS OF AMENDMENTS

An Amendment After Final Rejection was filed on June 16, 2005. By an Advisory Action dated August 4, 2005, it was indicated that the requested amendments to claim 1 and 2 would be entered upon the filing of this appeal.

Entry of the Amendment After Final Rejection resulted in amendment of claim 1 and cancellation of claim 2. The claims in Appendix A hereto reflect entry of these amendments.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1 is directed to solid phase extraction process for extracting an analyte from a sample comprising one or more of a) conditioning a sorbent in a cartridge by passing a liquid suitable for conditioning through the cartridge; b) applying a sample that contains the analyte to the sorbent by passing a liquid which contains the sample through the cartridge; c) washing the sorbent by passing a wash liquid through the cartridge; d) eluting the analyte from the sorbent by passing an elution liquid through the cartridge, wherein the temperature of the cartridge is raised or lowered to a predetermined value during one or more of the steps a) to d), and wherein the temperature of the cartridge is raised or lowered by heating or cooling one or more of the liquids used in step a) to d) before feeding to the cartridge.

Claim 1 is particularly directed to the field of solid phase extraction, such as solid phase extraction as a preparation for an analytical process. The various steps of the solid phase extraction outlined in claim 1 are not all always employed in the claimed method; thus, claim 1 recites that one or more of steps a) to d) are employed in the process.

The entire solid phase extraction procedure can be carried out at a predetermined and controlled temperature. The temperature control makes it possible to reduce the amount of solvent used and the process time. See page 2, lines 15-19 of the specification. The temperature of the cartridge is controlled by heating or cooling the liquids used in the process prior to feeding the liquid to the cartridge. See page 2, lines 20-22 of the specification. Thus, not only is the temperature of the liquid controlled, the temperature of the cartridge itself is also controlled. As the temperature of the cartridge is controlled, the temperature of the sorbent in the cartridge is similarly controlled.

The temperature control may be employed with the liquid for conditioning of the sorbent, the liquid that contains the sample, the wash liquid and/or the elution liquid. See page 2, lines 22-24 of the specification.

Such a process for cartridge temperature control in solid phase extraction provides a variety of benefits and advantages. For example, a change in temperature can take place relatively rapidly, both when heating the liquid is concerned and when cooling has to be carried out between two steps. See page 2, lines 27-29 of the specification. Another advantage is that the heating means can be constructed with a relatively small volume. See page 2, lines 29-31 of the specification. Further, if the elution liquid is heated prior to feeding it to the cartridge, then the desorption of the analyte will be accelerated. The analyte is thus desorbed into a smaller volume. See page 2, lines 32-33 of the specification. Control of the temperature also has an effect on the efficiency of the extraction (recovery). Temperature changes influence breakthrough volume. Thus, a controlled temperature increases the precision and reproducibility of the extraction. See page 3, lines 3-7 of the specification.

VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

The following grounds of rejection are presented for review:

1) Claims 1 and 3-7 are rejected as allegedly being obvious under 35 U.S.C. §103(a) over U.S. Patent No. 5,512,168 (hereinafter "Fetner") in view of U.S. Patent No. 5,496,741 (hereinafter "Pawliszyn").

VII. ARGUMENT

A. Claims 1 and 3-7 Would Not Have Been Obvious Over Fetner in View of Pawliszyn

Claims 1 and 3-7 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Fetner in view of Pawliszyn. According to the Examiner, the difference between claim 1 and Fetner resides in the fact that the method of Fetner does not teach or suggest raising or lowering the temperature of the cartridge to a predetermined value. The Examiner alleges that Pawliszyn teaches a temperature differential between a sample and a sorbent. The Examiner further alleges that it would have been obvious to one skilled in the art to apply the teachings of Pawliszyn to Fetner to create the method recited in claim 1. Applicants strenuously disagree with these allegations.

1. Pawliszyn and Fetner, in Combination or Alone, do not Teach or Suggest Passing Heated or Cooled Liquid Through the Cartridge to Control the Temperature of the Cartridge

Applicants submit that Fetner and Pawliszyn, in combination or alone, do not teach or suggest that the temperature of the cartridge is raised or lowered by heating or cooling one or more of the liquids used in steps a) to d) before feeding to the cartridge as recited in claim 1.

Fetner teaches a solid phase extraction elution device that purifies one or more particular solutes from a contaminated solution, said purified solutes then being recovered as a concentrated solution suitable for analysis. See the Abstract of Fetner. Further, Fetner relates to a liquid chromatography device. The Examiner admits that Fetner does not teach or suggest raising or lowering the temperature of the cartridge by heating or cooling a liquid to be fed to the cartridge as recited in claim 1. The Examiner thus relied upon Pawliszyn as allegedly teaching this feature.

Pawliszyn teaches a device and process for increasing analyte concentration in a sorbent from a source of analytes contained in a sample and means for increasing a temperature differential between the sample and the sorbent. See the Abstract of Pawliszyn.

Pawliszyn teaches a gas chromatography device. See, for example, column 2, lines 44-47 of Pawliszyn. In the rejection, the Examiner appears to equate the sorbent as described in Pawliszyn to the cartridge recited in claim 1.

Contrary to the assertions of the Examiner, Pawliszyn does not remedy the deficiencies of Fetner. In particular, Pawliszyn does not teach or suggest raising or lowering the temperature of the cartridge by heating or cooling one or more of the liquids recited in steps a) to d) of claim 1, and feeding such liquid to the cartridge as recited in claim 1.

Pawliszyn specifically teaches that if the sample is heated, the sorbent must be simultaneously cooled to prevent the sorbent from being heated. See column 6, lines 17-23 of Pawliszyn. Thus, according to Pawliszyn, if the liquid (sample) is being heated, the sorbent/cartridge must be cooled. In other words, the temperature of the cartridge (sorbent) is not being controlled by the temperature of the liquid (e.g., sample) passing through the cartridge.

Pawliszyn teaches that the sorbent has *internal cooling means* such as liquid carbon dioxide. See Figure 2 of Pawliszyn. Further, a Peltier cooling device 16 is connected to cool the polymer of the sorbent. See column 2, lines 18-19 of Pawliszyn. However, Pawliszyn nowhere teaches or suggests use of cooled liquid or heated liquid as in the one or more process steps a) to d) of present claim 1 to control the temperature of the cartridge. Instead, Pawliszyn requires cooling to be effected by means other than the liquids recited in these steps a) to d), for example such as by internal liquid carbon dioxide or a Peltier cooling device.

The carbon dioxide liquid is not equivalent to the liquid(s) employed in process steps a) to d) of present claim 1 to control the temperature of the cartridge. For example, possible conditioning liquids that may be used in step a) include methanol or acetonitrile. See page 3, lines 8-11 of the specification. The conditioning liquid may then be equilibrated with water.

See page 3, line 11 of the specification. Another example of a liquid that may be employed in steps a) to d) is water. Applicants submit that the liquid carbon dioxide as taught by Pawliszyn would not be an effective liquid suitable for conditioning, a liquid containing a sample, a wash liquid or an elution liquid, as required in steps a) to d) of claim 1.

Thus, Pawliszyn does not teach or suggest controlling the temperature of the cartridge by passing the heated or cooled liquids of one or more of steps a) to d) of claim 1 through the cartridge.

Furthermore, the temperature control taught by Pawliszyn is vastly different from the temperature control recited in claims 1 and 3-7. Pawliszyn specifically teaches that when the sample is heated, the sorbent must be cooled. In other words, the temperature of the sorbent must be controlled to move in a direction opposite to the temperature of the sample. This is the exact opposite from the method recited in claim 1. Claim 1 requires that the temperature of the cartridge be controlled by passing one or more of the heated or cooled liquids of steps a) to d) through the cartridge. The temperature of the cartridge thus necessarily moves in the same direction as the temperature of the liquid passing therethrough (that is, if the liquid is heated, the cartridge will be heated, not cooled as required in Pawliszyn). Accordingly, even if Pawliszyn were to have been combined with Fetner, one clearly would not have been led to the claimed method from such teachings, and in fact would have been led away from the claimed method.

In the Advisory Action, the Examiner alleged that the teachings of Pawliszyn would have given one of ordinary skill in the art the motivation to employ temperature control in an extraction system and thereby derive the method of claim 1. The Examiner here appears to attempt to explain a motivation for making the combination of references, but fails to recognize that even if motivation is established to combine the teachings, neither of the combined references teaches or suggests the recited method. Pawliszyn at best merely

teaches that temperature control may be used in an extraction system. However, Pawliszyn does not teach or suggest that the temperature of the cartridge is controlled by passing the heated or cooled liquids of any one or more of steps a) to d) through the cartridge, and thus does not remedy the admitted deficiencies of Fetner. The mere suggestion of temperature control in Pawliszyn does not teach or suggest the method recited in claim 1.

For all the foregoing reasons, Applicants submit that even if the teachings of Fetner and Pawliszyn were to have been combined as alleged by the Examiner, the solid phase extraction process recited in claim 1 would not have been achieved. Particularly, neither Fetner nor Pawliszyn teaches or suggests controlling the temperature of the cartridge by heating or cooling one or more of the liquids used in the recited steps a) to d) before feeding the liquid into the cartridge as recited in claim 1.

2. One of Ordinary Skill in the Art Would not have Combined the Teachings of Fetner with the Teachings of Pawliszyn

Fetner teaches the preparation of samples for liquid chromatography, while Pawliszyn teaches the preparation of samples for gas chromatography. As the Patent Office admits, the difference between Fetner and claim 1 resides in the fact that the method according to Fetner does not involve raising or lowering the temperature of the cartridge to a predetermined value.

In claim 1, the analyte remains in solution in the sample. The liquid (sample) is led through the cartridge (solid sorbent) for extraction of the analyte based on liquid-solid interaction. Heating of the cartridge (sorbent) is shown to reduce the amount of analyte that is absorbed by the cartridge (sorbent) in this type of interaction. This is used to reduce the retention and accelerate both the release of matrix components and the analyte from the cartridge (sorbent) for better clean up and analysis respectively. See pages 25-26 of the specification.

Pawliszyn teaches the preparation of samples for gas chromatography. Pawliszyn teaches heating the sample solution to increase analyte vapor pressure in the headspace above the sample liquid. See column 6 of Pawliszyn. The sorbent, which is placed in the sample headspace, is thus exposed to increased analyte concentration resulting in higher analyte absorption. Cooling of the sorbent helps to further increase the sorption of analyte from the gaseous sample headspace by the solid sorbent.

According to Pawliszyn, the sample may be heated to further increase the temperature differential between the sample and the sorbent. Heating of the sample enhances the volatility of the analytes in the headspace such that more analytes reach the analytical gas chromatographic column.

Clearly, Fetner and Pawliszyn relate to very different analytical techniques that have their own field of application. The equilibrium of vapor-solid as taught by Pawliszyn is completely different from the solid-liquid equilibrium taught by Fetner. Thus, one skilled in the art of solid-liquid extraction for liquid chromatography would not have applied teachings in the field of solid-vapor extraction for gas chromatography. In particular, one of ordinary skill in the art would not have sought to achieve an increased analyte vapor pressure in the headspace above a sample liquid in Fetner, and thus would not have sought to employ therein a temperature differential as used in Pawliszyn. In other words, the temperature differential taught by Pawliszyn has no utility in the different process taught by Fetner.

Applicants submit that one of ordinary skill in the art would not have looked to heating the sample solution to increase analyte vapor pressure in the headspace above the sample liquid as taught by Pawliszyn to modify the solid-liquid equilibrium taught by Fetner. Applicants thus submit that one of ordinary skill in the art would not have looked to Pawliszyn to modify the vastly different method of Fetner.

3. Conclusion

For the foregoing reasons, Applicants submit that claims 1 and 3-7 are patentable over Fetner and Pawliszyn, taken alone or in combination.

B. Rejoinder

Applicants respectfully submit that all withdrawn claims, and at least claims 8-10, should be rejoined with claims 1-7. In particular, claims 8-10 are drawn to a solid phase extraction apparatus, while claims 1-7 are drawn to a solid phase extraction process. A product and a process that are related to each other will be considered to have unity of invention. 37 C.F.R. §1.475(b)(1-5).

Thus, Applicants respectfully request that at the very least, claims 8-10 be rejoined with claims 1-7.

VIII. CONCLUSION

For all of the reasons discussed above, it is respectfully submitted that the rejections are in error and that claims 1 and 3-30 are in condition for allowance. For all of the above reasons, Appellants respectfully request this Honorable Board to reverse the rejection of claims 1 and 3-7.

Respectfully submitted,

Leana Levin

James A. Oliff
Registration No. 27,075

Leana Levin
Registration No. 51,939

JAO:LL/lxl

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

Filed: October 17, 2005

APPENDIX A - CLAIMS APPENDIX

CLAIMS INVOLVED IN THE APPEAL:

1. Solid phase extraction process for extracting an analyte from a sample comprising one or more of the following steps:
 - a) conditioning a sorbent in a cartridge by passing a liquid suitable for conditioning through the cartridge;
 - b) applying a sample that contains the analyte to the sorbent by passing a liquid which contains the sample through the cartridge;
 - c) washing the sorbent by passing a wash liquid through the cartridge;
 - d) eluting the analyte from the sorbent by passing an elution liquid through the cartridge,wherein the temperature of the cartridge is raised or lowered to a predetermined value during one or more of the steps a) to d), and
wherein the temperature of the cartridge is raised or lowered by heating or cooling one or more of the liquids used in step a) to d) before feeding to the cartridge.
2. (Cancelled)
3. Solid phase extraction process according to Claim 1, wherein the temperature of the cartridge is raised or lowered in step a), preferably by heating or cooling the liquid for conditioning of the sorbent.
4. Solid phase extraction process according to Claim 1, wherein the temperature of the cartridge is raised or lowered in step b), preferably by heating or cooling the liquid which contains the sample.
5. Solid phase extraction process according to Claim 1, wherein the temperature of the cartridge is raised or lowered in step c), preferably by heating or cooling the wash liquid.

6. Solid phase extraction process according to Claim 1, wherein the temperature of the cartridge is raised or lowered in step d), preferably by heating or cooling the elution liquid.

7. Solid phase extraction according to Claim 1 which also comprises the step of drying the cartridge, before or after one or more of the steps a) to d), drying being carried out by passing a suitable gas through the cartridge, wherein the gas is heated prior to feeding to the cartridge.

8. (Withdrawn) Solid phase extraction instrument comprising:

- at least one line system for transporting a liquid;
- a cartridge exchanging system having at least one cartridge holder for holding a cartridge incorporated in the line system;
- a sample feed device connected to the line system;
- a solvent feed device connected to the line system,

wherein the sample feed device and the solvent feed device are connected by the line system to the cartridge holder such that a liquid can be transported from the sample feed device or the solvent feed device to the cartridge holder and can pass through the cartridge, wherein

the line system is provided with heating and/or cooling means such that the liquid issuing from the sample feed device or the solvent feed device flows successively through the heating and/or cooling means and the at least one cartridge holder.

9. (Withdrawn) Solid phase extraction instrument according to Claim 8, comprising a control system, wherein the control system is equipped to be able to control the heating and/or cooling means.

10. (Withdrawn) Solid phase extraction instrument according to Claim 8, wherein the line system is provided with a gas connection and valve means in order to connect the gas

connection to the heating and/or cooling means and the at least one cartridge holder in such a way that gas issuing from the gas connection flows successively through the heating and/or cooling means and the at least one cartridge holder.

11. (Withdrawn) Solid phase extraction instrument, comprising:

- at least one line system for transporting a liquid;
- a cartridge exchanging system having at least one cartridge holder for holding a cartridge incorporated in the line system;
- a sample feed device connected to the line system;
- a solvent feed device connected to the line system; and
- a control system,

wherein the sample feed device and the solvent feed device are connected by the line system to the cartridge holder such that a liquid can be transported from the sample feed device or the solvent feed device to the cartridge holder and can pass through the cartridge,

wherein

the cartridge exchanging system comprises:

- at least one cartridge magazine having a multiplicity of cartridge locations or at least one cartridge magazine holder in which at least one cartridge magazine having a multiplicity of cartridge locations can be accommodated; and
- a transport system for moving cartridges; and in that the control system is equipped to:
 - determine one of the multiplicity of cartridge locations depending on a command given to the control system via input means; and
 - control the transport system to move a cartridge between a cartridge location and a cartridge holder, or vice versa.

12. (Withdrawn) Solid phase extraction instrument according to Claim 11, wherein the cartridge exchanging system comprises two of said cartridge holders incorporated in the line system and that the control system is equipped to control the transport system to move a cartridge between the two cartridge holders.

13. (Withdrawn) Solid phase extraction instrument according to Claim 11, wherein the transport system comprises a guide bridge with one or more cartridge grippers mounted thereon and movable along said guide bridge, in that the guide bridge is mounted above the at least one cartridge magazine, or the at least one cartridge magazine holder, and in that the guide bridge and the at least one cartridge magazine, or the at least one cartridge magazine holder, are movable relative to one another in a direction essentially transverse to the longitudinal direction of the guide bridge, and in that the control system is equipped to control this mutual movement.

14. (Withdrawn) Solid phase extraction instrument according to Claim 12, wherein the transport system comprises two cartridge grippers for picking up, moving and setting down cartridges, which cartridge grippers can be controlled essentially independently of one another by the control system.

15. (Withdrawn) Solid phase extraction instrument according to Claim 14, wherein the control system is equipped to move the at least one cartridge magazine, or the at least one cartridge magazine holder.

16. (Withdrawn) Solid phase extraction instrument according to Claim 13, wherein this comprises at least two cartridge magazines, or cartridge magazine holders, which are positioned alongside one another viewed in the longitudinal direction of the guide bridge and in that said cartridge magazines, or cartridge magazine holders, are movable relative to one another in the transverse direction of the guide bridge, and in that the control system is

equipped to move said cartridge magazines, or cartridge magazine holders, relative to one another.

17. (Withdrawn) Solid phase extraction instrument according to Claim 11, wherein the input means are equipped for entering an operator's choice for a specific solid phase extraction process and in that the control system is equipped to select the type of cartridge belonging to that specific solid phase extraction process; and/or in that the input means are equipped to enter an operator's choice for a specific type of cartridge, the control system being equipped to determine the specific cartridge location which contains an unused cartridge of that selected or specified type of cartridge.

18. (Withdrawn) Solid phase extraction instrument according to Claim 11, wherein the at least one line system comprises at least one single or multi-way valve which is functionally connected to the control system for operation, and comprises at least two cartridge holders, wherein the control system is equipped to:

- a) switch two cartridge holders in series; and/or
- b) to switch the one cartridge holder in liquid communication with a solvent feed device located upstream thereof and to be able to switch the other cartridge holder in simultaneous liquid communication with a sample feed device located upstream thereof; and/or

to switch the one and the other cartridge holder each in mutual simultaneous liquid communication with a solvent feed device or a sample feed device.

19. (Withdrawn) Solid phase extraction instrument according to Claim 11, wherein at least one cartridge magazine and/or the cartridges are provided with code means for the type of cartridge in each cartridge location or for the type of cartridge, and in that the solid phase extraction instrument is provided with reading means for reading the code means and for transmitting the code(s) read to the control system.

20. (Withdrawn) Solid phase extraction instrument according to Claim 19, wherein the control system is equipped to control the reading means to read the code means in order to store the type of cartridge associated with each cartridge location in a cartridge memory.

21. (Withdrawn) Solid phase extraction instrument according to Claim 20, wherein the control system is equipped to assign a used or unused status to each cartridge location in the cartridge memory.

22. (Withdrawn) Solid phase extraction instrument comprising

- at least one line system for transporting a liquid;
- a cartridge exchanging system having at least one cartridge holder for holding a cartridge incorporated in the line system;
- a sample feed device connected to the line system;
- a solvent feed device connected to the line system; and
- a control system,

wherein the sample feed device and the solvent feed device are connected by the line system to the cartridge holder such that a liquid can be transported from the sample feed device or the solvent feed device to the cartridge holder and can pass through the cartridge,

wherein

the solvent feed device comprises an injection pump consisting of a piston housing, in which piston is accommodated, which piston can be controlled by means of the control system for movement and

in that the control system is equipped to control the suction stroke speed and/or the suction stroke length of the injection pump so as to draw in solvent at a specific speed or in a specific quantity.

23. (Withdrawn) Solid phase extraction instrument according to Claim 22, wherein the injection pump has been designed with a capacity such that it is able to take up the total quantity of solvent required for a solid phase extraction step in order to be able to force this through the line system with an uninterrupted delivery stroke.

24. (Withdrawn) Solid phase extraction instrument according to Claim 23, wherein the control system is equipped first to control the injection pump to take up the total quantity of solvent required for a solid phase extraction step and then to control the injection pump to force this total required quantity through the line system with an uninterrupted delivery stroke.

25. (Withdrawn) Solid phase extraction instrument according to Claim 22, wherein the control system is equipped to be able to control the injection pump for a delivery stroke with an essentially constant speed or delivery pressure.

26. (Withdrawn) Solid phase extraction instrument according to Claim 22, wherein a pressure sensor for measuring the pressure in the injection pump is provided in or by the injection pump, which pressure sensor is actively connected to the control system in order to transmit a pressure signal to the latter.

27. (Withdrawn) Solid phase extraction instrument according to Claim 22, wherein the solvent fee device comprises a first multi-way valve to which, on the one side, the injection pump is connected by means of the suction channel and which, on the other side, is provided with a number of solvent connections to which solvent reservoirs can be connected or have been connected, and in that the control system is equipped to switch the multi-way valve during suction by the injection pump in such a way that a mixture is drawn in which is collected in the injection pump and/or to switch the multi-way valve prior to suction by the injection pump.

28. (Withdrawn) Solid phase extraction instrument according to Claim 27, wherein the suction channel of the injection pump connected to one side of the multi-way valve is also a pressure channel and in that the multi-way valve is further connected on the other side to the line system.

29. (Withdrawn) Solid phase extraction instrument according to Claim 27 wherein the solvent feed device comprises at least a further multi-way valve to which, on the one side, one of the solvent connections of the first multi-way valve is connected and which, on the other side, is provided with further solvent connections.

30. (Withdrawn) Solid phase extraction instrument according to Claim 22, wherein the control system comprises input means for entering an operator's choice for

- a specific solid phase extraction process; and/or
- a specific solvent or combination of solvents; and/or
- a specific delivery pressure; and/or
- a specific suction speed; and/or
- a specific solvent volume; and/or
- a specific ration of solvent volumes.

APPENDIX B - EVIDENCE APPENDIX

NONE

APPENDIX C - RELATED PROCEEDINGS APPENDIX

NONE